In the Claims

1. (Currently Amended) A method for utilizing a plurality of transmitters to determine one or more location characteristics of a body, said plurality of transmitters producing a plurality of RF carrier signals, said method comprising:

mounting one or more distributed antennas to said body, each of said one or more distributed antennas being comprised of at least one antenna element, [each] at least one of said one or more distributed antennas having [a non-unique phase center] a plurality of phase centers such that said plurality of phase centers is equal in number to said plurality of transmitters from which said RF carrier signals are received, each phase center being associated with a respective one of said plurality of transmitters from which said respective RF carrier signals are received, a location of each of said plurality of phase centers being variable with respect to said at least one antenna element in response to a change of a relative orientation between said one or more distributed antennas and said plurality of transmitters;

receiving said plurality of RF carrier signals from said plurality of transmitters with said one or more distributed antennas; and

determining said one or more location characteristics of said body.

2. (Currently Amended) The method of Claim 1, wherein said at least one antenna of said distributed antennas comprises a single continuous antenna radiator and said method further comprises simultaneously receiving all of said plurality of RF carrier signals from

said single continuous antenna radiator. [wherein said step of determining further comprises utilizing carrier phase measurements for determining said one or more characteristics of said body.]

3. (Original) The method of Claim 1, wherein said one or more location characteristics comprises a position of said body.

4. (Original) The method of Claim 1, wherein said one or more location characteristics comprises an attitude of said body.

5. (Original) The method of Claim 1, wherein each of said one or more distributed antennas has a substantially spherical coverage.

6. (Original) The method of Claim 1, wherein at least a portion of a view of said one or more transmitters by said one or distributed antennas is blocked by said body.

7. (Original) The method of Claim 6, further comprising providing that each of said one or more distributed antennas are circularly constructed with a respective physical origin.

8. (Currently Amended) The method of Claim 7, further comprising determining a vector from said respective physical origin to [a] each said phase center [for] associated with each of said respective one [each] of said plurality of transmitters.

9. (Currently Amended) The method of Claim 1, further comprising determining a distance between each respective one of said plurality of transmitters and each [of a plurality of] phase center[s] associated therewith [whereby each phase center corresponds to one of said plurality of transmitters].

10. (Original) The method of Claim 1, further comprising obtaining a coarse estimate of a position of said body, and utilizing said coarse estimate for determining a unit vector related to a first position vector of a physical center of said distributed antenna with respect to a reference system and a second position vector between said body and a respective of said plurality of satellites.

11. (Original) The method of Claim 10, further comprising utilizing said unit vector for obtaining an improved estimate of a position of said body, and utilizing said improved estimate for iteratively determining said unit vector more accurately.

12. (Currently Amended) The method of Claim 1, further comprising determining information related to a phase center constellation comprised of [a] said plurality of phase centers [such that each phase center in said phase center constellation is related to a respective of said plurality of transmitters].

13. (Original) The method of Claim 12, further comprising determining a plurality of vector magnitudes whereby each vector magnitude is related to a vector from a physical center of said distributed antenna to one of said plurality of phase centers.

14. (Currently Amended) A method for utilizing a plurality of transmitters in a plurality of locations to determine one or more location characteristics of a body, said method comprising:

mounting one or more distributed antennas to said body, [each] at least one of said one or more distributed antennas having a plurality of phase centers with respect to said plurality of locations of said plurality of transmitters, said plurality of phase centers being always equal in number to said plurality of transmitters from which respective transmitter signals are received from said plurality of transmitters by said at least one of said one or more distributed antennas, each of said plurality of phase centers being associated with a respective one of said plurality of transmitters from which said respective transmitter signals are received; and

determining one or more values related to said plurality of phase centers.

15. (Original) The method of Claim 14, further comprising:

determining one or more values related to a vector to a reference center of said body with respect to a fixed coordinate system.

16. (Original) The method of Claim 15, further comprising:

determining one or more values related to a position vector from said reference center to an i^{th} satellite.

17. (Original) The method of Claim 16, further comprising:

determining one or more values related to a vector from said reference center to a phase center related to said i^{th} satellite.

18. (Original) The method of Claim 17, further comprising:

determining an attitude vector for said body.

19. (Original) The method of Claim 16, further comprising:

determining a unit vector for said body from said reference center with respect to an i^{th} satellite.

20. (Original) The method of Claim 16, further comprising:

estimating a unit vector by obtaining an estimate of said position vector.

21. (Original) The method of Claim 20, further comprising:

reducing the error of said estimate of said unit vector by iteration.

22. (Original) The method of Claim 14, further comprising:

measuring a carrier phase from an i^{th} satellite, and adding a correction to said measured carrier phase.

23. (Original) The method of Claim 22, wherein said correction is determined utilizing a known attitude of said body.

24. (Original) The method of Claim 22, wherein said correction is determined by making an approximation of said position vector.

25. (Currently Amended) A system for determining location characteristics of a body utilizing a plurality of spaced apart transmitters, said system comprising:

one or more antennas mounted to said body, each of said one or more antennas comprising at least one antenna element, [each] at least one of said one or more antennas having [a non-unique phase center with respect to said plurality of spaced apart transmitters, said one or more antennas providing a wide angle coverage for maintaining contact with said one or more spaced apart transmitters;] a plurality of phase centers such that a location of each of said phase centers moves with respect to said at least one antenna element with variation of a relative orientation between said one or more antennas and said plurality of spaced apart transmitters; and

means for determining said location characteristics in response to reception of signals from said spaced apart transmitters by said one or more antennas.

26. (Original) The system of Claim 25, wherein said means for determining said location characteristics comprises utilizing one or more equations related to calculating a carrier phase.

27. (Original) The system of Claim 25, wherein said means for determining said location characteristics utilizes the following equation:

$$\|v_i\|^2 = \|r_{si} - r_B\|^2 + \|r_{pi}\|^2 - 2\|r_{pi}\|\|r_{si} - r_B\|\cos(\beta_i)$$

where

$$\cos(\beta_i) = \sin(\alpha_i) = \sqrt{1 - \frac{(r_{si} - r_B) \bullet \hat{z}_B}{\|r_{si} - r_B\|}}$$

and

$$\hat{z}_B = \sin(\theta_B)[\hat{x}_e \cos(\phi_B) + \hat{y}_e \sin(\phi_B)] + \hat{z}_e \cos(\theta_B)$$

28. (Original) The system of Claim 25, wherein said means for determining said location characteristics utilizes the following equation:

$$\|v_i\| = \|r_{si} - r_B\| - r_{pi} \bullet \frac{r_{si} - r_B}{\|r_{si} - r_B\|}$$

29. (Original) The system of Claim 25, wherein said means for determining said location characteristics utilizes the following equation:

$$\|v_i\| = \|r_{si} - r_B\| - \|r_{pi}\|\cos(\beta_i)$$

30. (Original) The system of Claim 25, wherein said means for determining said location characteristics utilizes the following equation:

$$\tilde{\hat{r}}_{sib} \approx \frac{r_{si} - \tilde{r}_b}{\|r_{si} - \tilde{r}_b\|}$$

31. (Original) The system of Claim 25, wherein said means for determining said location characteristics utilizes the following equation:

$$\Delta = k\|r_{pi}\|\sin(\xi)$$

32. (Original) The system of Claim 25, wherein said means for determining said location characteristics utilizes the following equation:

$$\Delta_j = \alpha_0 k\|r_{pi}\|\sin(\xi), j = 1,...,N$$

33. (Currently Amended) A radiator system for determining location characteristics of a body utilizing a plurality of spaced apart transmitters, said body [having] comprising a [curved] surface defining a periphery of said body, said periphery extending around said

body, said radiator system comprising:

[one or more radiators] a continuous wrap-around antenna element mounted with respect to said [curved surface] periphery of said body [so as to conform to said curved surface] , [each of said one or more radiators having a non-unique phase center] said continuous wrap-around antenna element having a plurality of phase centers such that said plurality of phase centers is equal in number to [with respect to] said plurality of spaced apart transmitters from which respective transmitter signals are received from said plurality of transmitters by said continuous wrap-around antenna element, each of said plurality of phase centers being associated with a respective one of said plurality of transmitters from which said respective transmitter signals are received [, said one or more radiators providing a wide angle coverage for maintaining contact with said one or more spaced apart transmitters].

34. (Currently Amended) The radiator system of Claim 33, wherein said [one or more radiators] continuous wrap-around antenna element comprises a first circular ring.

35. (Currently Amended)The radiator system of Claim [33] 34, further comprising a second circular ring [wherein said one or more radiators comprises a plurality of circular rings].

36. (Currently Amended) The radiator system of Claim 33, [further comprising] wherein said continuous wrap-around antenna element extends more than 180° around said

periphery of said body [means for determining said location characteristics in response to reception of signals from said spaced apart transmitters by said one or more radiators].

37. (Currently Amended) The radiator system of Claim 33, wherein said continuous wrap-around antenna element is operable for maintaining continuous contact with said plurality of spaced apart transmitters as said body rotates even when said body obscures a view of said one or more spaced apart transmitters from a portion of said continuous wrap around antenna element. [means for determining said location characteristics comprises utilizing one or more equations related to a carrier phase.]

38. (Currently Amended) The radiator system of Claim 33, further comprising means for determining an attitude of said body utilizing no more than two of said continuous wrap-around antenna elements [radiators] wherein said body has three degrees of freedom.

39. (Currently Amended) The radiator system of Claim 33, further comprising means for determining an attitude of said body utilizing no more than [one] said continuous wrap-around antenna element [radiator] wherein said body has two degrees of freedom.

40. (Canceled) [The radiator system of Claim 33, wherein said one or more radiators maintain contact with said plurality of spaced apart transmitters even when a portion of a view of said one or more radiators to said plurality of spaced apart transmitters is blocked.]

41. (Currently Amended) A method for carrier phase determination of location characteristics utilizing a plurality of spaced apart transmitters, comprising:

mounting one or more antennas to a moveable body positioned among said plurality of spaced apart transmitters such that said one or more antennas maintain contact with each of said plurality of spaced apart [antennas] transmitters as said attitude of said body changes without utilizing RF switches, each of said one or more antennas being comprised of at least one antenna element, at least one of said one or more antennas having a plurality of phase centers, a location of said plurality of phase centers being moveable with respect to said at least one antenna element in response to a variation of a relative orientation between said one or more antennas and said plurality of transmitters; and

determining one or more values related to one or more of said plurality of phase centers of said one or more antennas.

42. (Original) The method of Claim 41, further comprising determining an attitude solution for said body when said body has three degrees of freedom utilizing no more than two antennas.

43. (Original) The method of Claim 41, further comprising determining an attitude solution for said body when said body has two degrees of freedom utilizing no more than one antenna.

44. (Original) The method of Claim 41, further comprising providing that said one or more antennas has wide angle coverage for simultaneous contact with said plurality of spaced apart transmitters.